




# **Evaluation of Probable Benefits and Costs**

## **Amended Shoreline Master Program Guidelines** *(Chapter 173-26 WAC)*

November 2000  
Publication No. 00-06-043

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# **Washington State Department of Ecology**

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### **Amended Shoreline Master Program Guidelines (*Chapter 173-26 WAC*)**

The Administrative Procedure Act requires that, prior to the adoption of certain rules, an agency must "... Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented." (See RCW 34.05.328(1)(c).) This document represents a summary of the analysis conducted for the above-referenced rule. It does not attempt to address all aspects of the proposal, but rather focuses on a smaller subset of topics and issues that represent what are perceived to be significant departures from the existing rule (Chapter 173-16 WAC) and that have generated significant public concern. These topics and issues include vegetation conservation, shoreline modification, fisheries, implementation, and transfers and distributive effects.

It appears that some of this concern may stem from the fact that the existing rule has been in effect essentially unchanged for nearly thirty years. Although many of the provisions of the proposal can be traced back to antecedents in Chapter 173-16 WAC, the inclusion of substantial additional detail flowing from experience with the existing process and recognition of significant, new knowledge and information lends the appearance of a major revision.

More importantly, the proposed rule incorporates a strengthened recognition of the ecological interconnection between aquatic environments (streams, rivers, coastal waters) and their associated riparian, flood plain, and intertidal and upland terrestrial features. This approach recognizes that aquatic ecosystems are the product of interactions and influences occurring on a watershed or drainage scope, and that properly functioning ecosystems encompass a variety of habitats and species.

#### Special Considerations

A number of features of this analysis are unusual and merit special consideration. These include:

Part III as Reference State – In general, this discussion will seek to address new requirements stemming from Part III of the proposed rule. Part III is the "default approach" with which local governments must comply. Part IV (Path B) will be pursued only if an individual local government chooses to do so – a choice implying a judgement that, in that particular case, the probable benefits from gaining liability protection under the Endangered Species Act outweigh the

probable costs.

Local Governments as Regulated Community – As noted, the requirements of the proposed rule are addressed to local governments, not private entities. As such, this rule-making proposal would ordinarily be exempt from the requirements of RCW 34.05.328(1). (See RCW 34.05.328(5)(b)(ii).) Ecology has chosen to undertake this analysis in view of the importance of these issues to many individuals and organizations.

However, since the proposed rule relies heavily on performance standards and provides considerable flexibility to local governments in their achievement, it will be difficult to address ultimate impacts on variables like employment, incomes, property values, and other factors usually of interest in a benefit-cost evaluation. These will be significantly driven by decisions made at the local government level in the process of implementing the proposed rule. The process of making these decisions will include a significant public participation element.

As a result, parts of the analysis described here are based on “scenarios” – i.e., hypothetical constructs. While such constructs cannot fully capture the diversity that will be encountered in reality, the relationships demonstrated in these hypothetical settings would likely apply (to some degree) in real circumstances.

The Endangered Species Act – The listing of a number of Washington fish stocks as endangered or threatened under the federal Endangered Species Act (and the likelihood of additions to those listings) is a reality that cannot be ignored. Dealing with the legal implications of these listings, as well as addressing the longer-term preservation and enhancement of these fisheries, will require action on many fronts by many entities. The linkage between shoreline environments and the health of aquatic ecosystems and species is sufficient to make these implications difficult to ignore. The proposed amendments, therefore, include an approach (Part IV or “Path B”) by which local governments can address the Endangered Species Act concerns of the National Marine Fisheries Service and the U.S. Fish and Wildlife service should they choose to employ this vehicle.

### Vegetation Conservation

This term refers to directives that local Shoreline Master Programs contain elements protecting or, where and to the extent feasible, restoring the ecological functions and processes associated with shoreline vegetation. The term “buffers” has come to be used as a generic description for this Shoreline Master Program element. Although establishment of buffer or setback zones is one approach to fulfilling this requirement, other alternatives are available as described in WAC 173-26-220(5).

The contribution of shoreline vegetation to the productivity of aquatic and shoreline ecosystems has been extensively assessed and documented. An excellent summary can

be found in Lowrance et al. [5] providing a review of research bearing upon the role of shoreline vegetation zones to the productivity and quality of the waters in streams and rivers in the Chesapeake Bay watershed and, ultimately in the Bay itself.

In brief overall summary, the findings reviewed and discussed in this report suggest that an “ideal” shoreline vegetation system would consist of three zones that interact with each other in the control of pollutant loadings (especially nitrogen, phosphorus and sediment) delivered into the water, as well as performing certain individual functions. These zones and their joint and individual contributions to aquatic ecosystem health include:

1. Mature Forest – works with other zones in entrapment and uptake of pollutants and nutrients; contributes to aquatic environment health by providing shade-related stream temperature moderation and influencing algae types and growth rates (especially when streams are narrow enough to permit a full canopy, but useful along margins of wider streams and other water bodies); contributes to aquatic food chain via deposition of litter; contributes large woody debris; aids in streambank stabilization and erosion control.
2. Managed Forest – contributes significantly to sediment and nutrient entrapment and uptake (with an added benefit of enhanced tree growth in some species).
3. Grassy Vegetation Filter Strips – Contribute most significantly to sediment retention with added immobilization/uptake of nutrients, convert runoff to sheet flow to enhance functions of forested zones and reduce rate of runoff loadings into streams.

Of course, all three types of vegetation zones will not (and need not necessarily) exist at all places, or be of the optimal size for the settings in which they occur. However, benefits can still be gained from individual zone types or suboptimally sized areas. The following table summarizes information from a number of research studies reported in Lowrance [5].

POTENTIAL SEDIMENT AND NUTRIENT REDUCTION  
(percentages)

Zone Type	Zone Width (feet)	Sediment Reduction	Nitrogen Reduction	Phosphorus Reduction
Grass	15	61.0	4.0	28.5
Grass	30	74.6	22.7	24.2
Forest	62	89.8	74.3	70.0
Forest/Grass	76	96.0	75.3	78.5
Forest/Grass	95	97.4	80.1	77.2

Note, of course, that the above addresses only a small portion of the range of aquatic ecosystem benefits discussed on the previous page.

#### A Vegetation Conservation Scenario

Since new requirements of the proposed rule do not, in general, apply to existing land uses and activities, assessment of the benefits and costs of this element of the proposal will require positing a scenario involving a change in these. The scenario chosen for this analysis is not intended to be representative of any specific situation, but rather to illustrate the interplay of benefits and costs that may arise as development and redevelopment proceeds under the amended rule.

Changes in land use in the area covered by the Shoreline Management Act can involve new industrial, commercial, or residential development -- particularly in urban areas. While commercial or industrial development is not precluded in more rural settings, the dominant development pressure there appears to be conversion of land from (primarily) agricultural uses to residential development, either for permanent occupancy or recreational uses. A hypothetical case revolving around such development has been constructed. The salient features include:

- Selection of a group of non-urban counties<sup>1</sup> appearing to be subject to significant development pressure. Selection of these was based on the counties having attractive recreational characteristics and/or being on the fringe of growing urbanized areas.
- In addition, the selected counties meet two or more of the following criteria (based on data compiled and published by the Office of Financial Management and Department of Revenue.) These include; (i) the relative contribution of net migration to population growth during the 1990s exceeding that for the state as a

<sup>1</sup> The counties chosen include Chelan, Clallam, Cowlitz, Grays Harbor, Jefferson, Kittitas, Lewis, Mason, Skagit and Whatcom.

whole, (ii) a relative difference between 1998<sup>2</sup> true and fair market value assessments versus current use assessments on lands enrolled under Chapter 84.34 RCW greater than that for the state as a whole, and (iii) a relative (inflation adjusted) contribution of “new construction” to total assessed value during the 1990s greater than that for the state as a whole.

Criterion (ii) above was chosen in order to confine the scope of the analysis to land values only. For the selected group of counties as a whole, 1998 true and fair market values of \$4,078 per acre, \$1,856 per acre and \$6,913 per acre are the average, minimum, and maximum values, respectively, reported by the Department of Revenue. These values provide the basis for the analysis further described below.

The “test case” used here is a 100 acre, perfectly square parcel of agricultural land exactly bisected by a stream. (The acreage is net of the area covered by the stream.) This parcel is to be subdivided into residential lots of one acre each. Area taken up by roads and other required infrastructure is ignored here in order to simplify the computations. The end result would be a five-wide by ten long block of one-acre residential lots on each side of the stream, net of any vegetation conservation area requirements that might occur as a result of the proposed rule. Since it is unknown how wide this area might be (or, indeed, if there would be one), three cases are considered here. These are vegetation conservation areas (“buffers”) of 30 feet, 60 feet, and 100 feet wide on either side of the stream.<sup>3</sup> Estimated probable benefits and costs have been developed for each of these as described below and shown in the tables on page 7. Categories of benefits and costs are as follows:

1. Foregone development value: In the absence of requirements arising out of the proposed rule (or for any other reason), residential lots could, presumably be platted and developed to the edge of the stream. Vegetation conservation requirements would restrict such development. The value of land on which full development is precluded enters the calculation as a cost and is displayed with minus signs at average, minimum, and maximum land values adjusted as described below.

It is well established that land located on shorelines immediately proximate to the water’s edge command a premium in the market. Use of unmodified average land values would ignore this effect and understate foregone development costs. An adjustment for this has been made by applying research reported by Brown and Pollakowski [1] that included estimates of the impacts of distance from the water’s edge on the value of shoreline and shoreline-area properties. Specifically, the average, minimum and maximum land values reported above were assigned to

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<sup>2</sup> 1998 is the latest year in which reliable data for all factors involved in the analysis is available.

<sup>3</sup> Wider areas have arisen in previous comment and discussion of the proposal. However, the information currently available does not lend itself to complete evaluation of areas greater than 100 feet. If such information becomes available, this analysis will be extended to take it into account.

the middle groups of lots (those in the third row back from the water's edge on each side of the stream) and the Brown/Pollakowski distance relationship was applied to estimate a proximity premium for the group of lots closest to the stream. (Under the one-acre per lot assumption used here, all three "buffer" widths would fall within the area covered by this group of lots.) These adjusted values were used to estimate the foregone development value costs.

Of course, even this adjustment may underestimate the foregone proximity premium in any particular market or situation. However, the other impacts (benefits) described here were evaluated at the average, minimum, and maximum values shown on page 7. Since these are also related to land values, the benefit estimates shown here are likely to be underestimated as well. Presumably, these errors at least somewhat offset each other.

2. Distance from the water's edge: As noted above, Brown and Pollakowski's research verifies that property values in shoreline areas decline as distance from the water's edge increases. However, that study also compared effects on property values where development had occurred to the water's edge with an area where the water body in question was surrounded by vegetated open space of varying widths.<sup>4</sup> Their findings were that the existence and width of vegetated open space areas reduced the rate at which property values declined with distance from the water's edge.<sup>5</sup> These findings (adjusted for inflation and property value differences in Seattle/King County versus those used here) have been applied in this case. Thus, the results reported under the heading of "Distance" in the following tables reflect the difference between the proximity-related declines in property values in an open space versus a no-open space situation. Since the latter are smaller than the former, these results enter as a benefit with a positive sign.
3. Setback: This is the term used by Brown and Pollakowski to denote the width of the vegetated area (where one existed) closest to a property in their study. Their findings (again confirmed by Leggett and Bockstael [4]) were that increases in this width increased the value of a property - at least within a range covered by this analysis. This relationship (again adjusted) has been used to estimate setback benefits (entering with a plus sign).
4. Pollution: The research of Leggett and Bockstael [4] addressed the effects of water pollution levels on the values of shoreline and shoreline-vicinity property on Chesapeake Bay and streams tributary to the Bay. Adjusted values of their results have been combined with the results reported by Lowrance et al. [5] to estimate potential benefits stemming from the vegetation conservation zone

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<sup>4</sup> Specifically, the comparison was between properties in the vicinity of Lake Washington and Haller Lake (developed to the water's edge) with properties in the vicinity of Green Lake (with open space).

<sup>5</sup> Similar findings are reported by Leggett and Bockstael [4] in more recent research.

widths considered here.

Finally, the tables shown below display the net outcome of the estimated costs and benefits aggregated over all parcels for each vegetative conservation area at the average, minimum, and maximum land values used in this analysis.

# BENEFITS AND COSTS OF VEGETATIVE CONSERVATION (1998 dollars - costs enter with minus signs)

## AVERAGE LAND VALUES

Width of Zone (ft)	Development Value	Distance	Setback	Pollution	Total
30	- 18,692	29,024	4,549	13,906	28,787
60	- 37,384	29,024	5,477	29,915	24,031
100	- 62,306	29,204	6,160	28,954	1,831

## MINIMUM LAND VALUES

Width of Zone (ft)	Development Value	Distance	Setback	Pollution	Total
30	- 8,507	13,209	2,071	6,309	13,102
60	- 17,013	13,209	2,493	12,250	10,938
100	- 28,355	13,209	2,803	13,178	835

## MAXIMUM LAND VALUES

Width of Zone (ft)	Development Value	Distance	Setback	Pollution	Total
30	- 31,692	49,201	7,712	23,573	48,794
60	- 63,384	49,201	9,284	45,626	40,727
100	- 105,639	49,201	10,442	49,082	3,086

## Summing Up

Some readers of these results will doubtless take substantial exception to them. It should be noted, however, that – aside from undetected errors and omissions – the above is like all simulations in its sensitivity to the assumptions upon which it is based. Different land

and lot configurations, different vegetation conservation requirements, and different market land values than those used here can affect the distribution of benefits and costs and the size and sign of the end results. What should be noted, however, is that vegetation conservation requirements are not unmitigated costs. Offsetting individual and social benefits can – and do – occur.

### Shoreline Modification

The provisions proposed in WAC 173-26-230 address standards and criteria for local government development of Shoreline Master Program elements dealing with alterations to shorelines. Typically, these involve construction of a new or replacement physical element (dikes, bulkheads and seawalls, breakwaters, jetties, docks and piers), but can also include clearing, grading, chemical application and other nonstructural measures. The proposal provides for shoreline modifications where needed to support or protect principal structures (including single family dwellings) and permitted uses. Emphasis is given to limiting modification to the extent necessary to provide the required protection or support to the use. Nonstructural or “soft” structural approaches are encouraged, while “hard” structural measures are allowed when other alternatives are infeasible.<sup>6</sup> The remainder of this section focuses on this aspect of the proposal in the context of shoreline stabilization or erosion control.

### Shoreline Stabilization

Control of or protection against erosion impacts has traditionally relied upon bulkheads, seawalls, rock revetments and the like. While such measures can effectively protect property and shoreline uses, they are not without problems. Erosion damages are frequently transferred down current from the area being protected. Wave or current energy magnified by reflection off of a hard surface may result in continued or increased erosion of beaches and/or significant modification of the geomorphic character of the aquatic habitat in front of the structure. These measures are not permanent solutions to an erosion control problem. Continued frontal erosion usually leads to eventual undercutting of the toe of the structure, structural failure, and a requirement for replacement.<sup>7</sup>

Soft structural and nonstructural alternatives are available to deal with shoreline stabilization requirements where conditions allow their use. These are generally as effective as traditional, hard approaches (in appropriate settings) and often less costly. The following are provided as illustrative examples:

- a) A study by the National Research Council [6] examined the costs of stream bank stabilization via grading and riprap versus a selection of soft measures. The latter included use of large woody debris to divert current and shield

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<sup>6</sup> Further description and examples of such measures can be found in WAC 173-26-230(3)(a)(i).

<sup>7</sup> See, for example, City of Ocean Shores [2], p. 125

stream banks as well as vegetation restoration. Reported bank stabilization costs (in 1998 dollars) per lineal foot of a reference 12 foot high stream bank were \$15.15 for the riprap alternative, \$3.73 for vegetation restoration, and \$3.60 to \$4.48 for alternatives using large woody debris.<sup>8</sup>

- b) The Regulatory Fairness Act analysis (Small Business Economic Impact Statement)<sup>9</sup> prepared for 1994 amendments to the Hydraulic Code Rules (Chapter 220-110 WAC) addressed the same comparison. A more generalized measure (essentially equivalent to cost per square foot) was used in this case. The comparative results are, however, equivalent to the previous case. Again adjusting to 1998 price levels, rock riprap bank stabilization had estimated costs of \$4.30 per square foot while an approach relying on establishment of vegetation cost an estimated \$1.60 per square foot.
- c) The City of Ocean Shores, Washington has been addressing a beach erosion problem along a 6,200 feet long section north of the North Jetty. A Draft Environmental Impact Statement issued in May 1999 assessed the environmental and economic ramifications of alternatives for dealing with this problem. The alternatives considered in the final summing up included a rock revetment as representative of a range of shore-parallel hard structures, direct beach nourishment (a soft structural approach), and retreat from the eroding shoreline (with public acquisition of affected properties and movement of existing infrastructure) combined with reconstruction of a protective sand dune east of the projected erosion stabilization line. The latter illustrates a combination of nonstructural and soft structural measures. No final preferred alternative was identified in this DEIS, but the information summarized below provides a useful comparison.<sup>10</sup>

Costs for each of these alternatives were projected over a 50-year period and discounted back to a present value. The results were estimated (capital plus operation and maintenance) costs of \$45 million for the rock revetment alternative, \$90 to \$158 million for the direct nourishment alternative, and \$33 to \$39 million for the retreat/dune reconstruction alternative.<sup>11</sup> In addition to an apparent advantage in cost, this alternative offers the potential to be essentially permanent. The revetment/bulkhead alternative would require major maintenance/replacement on a ten-year cycle due to continued beach erosion and eventual undercutting of the structure. The direct nourishment of eroding beach areas would require sand reapplication on a three to five year cycle as erosion continues. These costs have been included in the estimates cited above. The retreat/dune reconstruction alternative attempts to function within the parameters of the natural processes now occurring and their

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<sup>8</sup> See National Research Council [6], p. 221

<sup>9</sup> See Washington State Register, WSR 94-11-126.

<sup>10</sup> The version of the DEIS cited here was intended to provide information to be used by local governments and others in selection of a preferred alternative.

<sup>11</sup> In the last case, \$27 to \$32 million represents estimated costs for acquisition and demolition of private properties and for movement and reconstruction of infrastructure.

eventual attainment of equilibrium.<sup>12</sup> The final choice of preferred alternative and action to be taken will be determined by the preferences and values of the population and property owners of Ocean Shores.

- d) An example of an erosion control design incorporating (somewhat) hard and softer measures can be found in a project design described by Mark G. Pederson [7] for replacement of failing concrete bulkhead on a property on the shoreline of Lake Washington. While the original bulkhead had provided erosion protection, reflected wave energy had adversely effected the natural environment upon which juvenile Chinook salmon and associated food organism depend. The resulting coarse substrate provided spawning habitat for bass, a known Chinook salmon predator.

The design for the replacement erosion control sought to recreate a more natural shoreline environment. Boulders of various shapes and sizes were placed to create an irregular shoreline, and smaller boulders were placed lakeward of the water line to create wave breaks and to provide cover for juvenile salmonids. Slab rocks were used with the wave revetment to create a shallow-water bench providing additional refuge areas for juvenile salmon. Project completion involved spreading gravel and planting vegetation. (See Pederson for a more detailed description.) The author was not able to provide an estimate of cost implications in this case, but characterized the cost of the described design as significantly less than that for removing and replacing the concrete bulkhead.<sup>13</sup>

### Fisheries

The interconnections between shoreline and shoreland environments and the health of associated aquatic ecosystems and the species dependent upon them have been summarized earlier in this discussion. It is apparent that – whether by accident or design – successful implementation of the proposed rule will contribute toward efforts and programs, at Ecology and elsewhere, aimed at preserving and enhancing those species and fisheries that have been (or will be) listed as threatened and endangered under the Endangered Species Act.

Assignment of a biologically determined, specific share of a particular fish stock's enhancement to the proposed rule amendments is not possible at this time. However, research conducted for Ecology by Layton, Brown, and Plummer [3] can be usefully applied to the illustration and economic evaluation of potential alternatives. In the interests of erring on the side of conservatism, a one percent enhancement of a collection of broadly defined fish stocks<sup>14</sup> over a period of years has been assumed and evaluated

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<sup>12</sup> Operation and maintenance costs for repair of storm damage to the dune, maintaining walkover structures, and vegetation replanting are acknowledged but not estimated.

<sup>13</sup> Pederson, personal communication.

<sup>14</sup> The fish stocks evaluated include Eastern Washington/Columbia River freshwater, Eastern

using the results of this research. The results, and discussion of additional adjustments lending a conservative cast to them, are presented below.

The basic data for the research was collected via a mail survey of Washington residents conducted in 1998. Information was collected regarding survey respondents' valuation of – and willingness to pay for – public programs aimed at enhancing fish populations over a twenty year period<sup>15</sup> This information was used by the authors to construct mathematical functions allowing estimation of the benefits associated with varying degrees of fish stock improvements relative to defined status quo conditions. Streams of monthly payments were converted to lump sum discounted present values for consistency with other values cited in this paper. Since the Shoreline Management Act and Chapter 173-26 WAC are applicable statewide, it is assumed that enhancement would affect all stocks listed in footnote 14 below.

With the above as background, the estimated value of a one percent improvement (versus a status quo described below) of all fish stocks would fall within a range from \$1.4 billion to \$2.4 billion. Readers should bear in mind that is this a lump sum, one time amount based on a stream of monthly utility bill surcharges. To provide perspective, these amounts represent 0.0076 percent and 0.013 percent of personal income in Washington for the year 2000. In this case, apparently, willingness to pay and ability to pay are in close correspondence.

#### Additional Adjustments to Fisheries Benefits

In addition to orienting the estimation of benefits in a conservative direction via initial selection of a low enhancement percentage, the following adjustments were made that reduce the results shown above compared to what would have been obtained by a simple, direct application of the Layton, Brown, and Plummer results:

- Baseline Adjustment: As noted above, the survey from which the basic data for this research was obtained sought to elicit information about households' preferences for varying degrees of fisheries enhancement through public sector programs relative to a "baseline" of probable future fish stocks without the intervention of such programs. The research design included the introduction of one of two alternative baselines to survey respondents (varying randomly among survey participants. One of these posited that fishery populations would decline over the 20 years after 1998 as they had over the previous 20 years (i.e., a "present trend continued" scenario). The second proposed a "without new public programs" baseline future in which declines in fish stocks were arrested – i.e. fish populations in 20 years would be the same as the 1998 levels provided in the survey instrument. Survey

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Washington/Columbia River migratory, Western Washington/Puget Sound freshwater, Western Washington/Puget Sound migratory, and Western Washington/Puget Sound saltwater stocks. Available biological information did not permit finer distinctions by species or runs.

<sup>15</sup> The payment vehicle used was a surcharge on household utility bills.

respondents were asked to provide information about their preferences and willingness to pay for varying levels of enhancement to varying fish stocks relative to the baseline described in the version of the survey questionnaire that each household in the sample received.

In keeping with the expectations of economic theory, willingness to pay for fish population enhancements over a twenty year time period relative to a “no further decline” baseline was less than willingness to pay for enhancements relative to a trend of continuation of the past twenty years’ fish population decline rates continued over the next twenty years.

Benefit estimates derived from the former (no further decline) information were used to develop the estimates reported here. This has been done in the interests of providing a conservative estimate.

- Time Horizon Adjustment: As noted previously, the Layton, Brown, and Plummer research design was based on a twenty year time horizon over which monthly utility bill surcharges would be incurred by Washington households to finance public programs to enhance threatened or endangered fish populations. This 20-year period would have begun in January of 1999 under the original research design. However, the analysis for this discussion occurs in the year 2000. Rather than assuming that the end of the time horizon could simply be extended to cover this lag, the end point has been held at the year 2018 and the number of years over which payments would occur has been shortened accordingly. This has the effect of reducing the discounted present value of the stream of household payments compared with what would have occurred under a more direct application of the research results.
- Discount Rate Adjustment: No attempt was made to introduce the impacts of inflation into the original Layton, Brown, and Plummer research design. In effect, the results derived there are in constant 1998 dollars. This is not a problem as long as results are reported in terms of dollars per time period (i.e., per month or per year). However, the process of discounting a stream of periodic payments to a lump sum present value raises the issue of choice of the appropriate discount rate, complicated in this case by distinguishing between the “real” component of that rate versus the inflation compensation component. In this case, the discounting process utilized the current market rate for inflation-adjusted U.S. Treasury securities – initially in November 1999 when initial conversion of monthly payment streams to lump sum discounted present values occurred. A check of public information sources during the process of the analysis described here indicated that this rate had increased by approximately one half of one percent since the initial check. The incorporation of this change into the estimates reported here also works in the direction of reducing estimated benefits below what would have been reported from a simple, direct application of the research results.

- Survey Non-Respondent Adjustment: No survey-based research is undertaken with the expectation that all members of the selected sample will respond. This raised the question of the appropriate treatment of non-responses when extrapolating the survey results to the population from which the sample has been drawn. The appropriate answer lies within a spectrum defined at one end by the assumption that non-respondents simply did not want to take the time and effort to fill in and return a survey questionnaire, but – if they had – their responses would have been distributed in the same pattern as those of members of the sample who did respond. At the other extreme, survey non-response can be interpreted as an indication that the non-respondents were registering a protest. In a survey like the one utilized here, this would take the form of assuming that non-respondents would have reported information yielding a willingness to pay of zero for fish population enhancements under any scenario with which they may have been provided. In fact, the true reasons for non-response likely involve some combination of these in the aggregate.

Little can be done to determine the actual reason for survey non-response in individual cases – especially where mail survey instruments are used.<sup>16</sup> However, strict application of the assumptions described above allows estimation of reporting of a range within which actual results probably lie. Application of these assumptions to the results of the survey data underlying the Layton, Brown, and Plummer research yields the end-points of the range of estimated fisheries benefits noted above.

### Summing Up

As noted above, the fisheries enhancement benefit estimates cannot be represented as based on biological or other, relevant scientific information. For this reason, the illustrative scenario developed here has been deliberately slanted toward conservatism. Even so, it is apparent that there are quite significant societal benefits to be obtained from the preservation and enhancement of threatened and endangered fish populations in Washington. Controversy and disagreement notwithstanding, it would not seem to be appropriate to ignore this fact.

### Implementation

This section of the discussion seeks to address the costs of implementation of the proposed rule amendments by state and local governments. Information available for this assessment is limited at this time. In fact, the best information obtainable at this writing appears to be an analysis conducted by Ecology staff and a small number of local

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<sup>16</sup> It is possible that non-respondents could be contacted and questioned about their reasons for not participating. While this can be done in a reasonably efficient fashion in direct interview and telephone survey formats, it can become prohibitively expensive in a mail survey framework.

governments<sup>17</sup> in 1999. The study attempted to elicit estimated costs both for initial implementation of the proposed rule amendments and for ongoing administration. Information provided about the former appears to be considerably more complete than the latter. After taking into account the size and diversity of the shoreline jurisdiction and the scope and complexity of issues to be addressed and resolved by various local governments, the information provided by study participants was extrapolated to an estimated total cost of approximately \$18.8 million (largely for initial implementation) for some 250 local governments likely to be affected by the proposed rule amendments.

It should be noted that the information underlying the estimate reported here was based on an earlier (August 1999) version of the proposed rule amendments. This version incorporated elements now treated separately in Part III and Part IV of the current proposal. Given this approach, it is likely that local governments choosing the former would incur somewhat lower costs than estimated in the 1999 study. Local jurisdictions choosing to follow the Part IV path may, in general, experience somewhat higher costs. Thus, even after allowing for errors in the original estimates, the above should be viewed as a “ballpark” approximation of actual implementation costs. As this is written, additional work is being done on development of updated estimates of local and state government costs.

### Transfers and Distributive Effects

Concerns have been raised about potential transfers arising out of the proposed rule amendments. These may include transfers of funding requirements between levels of government and /or transfers of wealth between individuals and businesses. Any change in the status quo – whether statutory or via administrative rule, in economic structure, or in social or political processes – give rise to transfers and similar concerns about them.<sup>18</sup> While these are acknowledged here, they cannot be usefully addressed in a benefit-cost framework. To the extent that the gains accruing to those who benefit from a transfer exactly offset the losses of those who are adversely affect, the overall, societal balance remains the same. Benefit-cost analysis seeks to address the question of whether – on net – the gains to all members of society at large exceed losses or costs measured on the same basis.

Concerns about the equity of the distribution of benefits and costs, are, of course, real and important – especially to those experiencing them. Societies can, and do, address these by other means involving both public and private actions and programs. The implications and effects of these actions and programs are, however, beyond the scope of analyses like the present one.

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<sup>17</sup> The local governments participating in the study included the Cities of Buckley, Bellingham, Dayton, and Everett; and Pend Oreille, Walla Walla, and Yakima Counties.

<sup>18</sup> Similar concerns were raised about the existing Guidelines rule (Chapter 173-16 WAC) in the early 1970s.

## Overall Summation

As noted previously, the nature of this proposal does not lend itself to ready application of “traditional” benefit-cost techniques. Further, limits on time and other resources have precluded addressing a large number of topics in extensive detail. Every effort has been made, however, to deal with those identified as most significant through staff analysis and the public review and comment process. The scenarios and hypothetical constructs used to illustrate potential benefits and costs are intended to be reasonable and to lean toward conservatism, but are unlikely to correspond exactly to any given situation that may arise in reality.

It is acknowledged that certain resource development and use costs (e.g., additional engineering, technical and design costs) may be incurred as a result of adoption of this proposal. However, many of these costs have been or will be incurred because of other existing or forthcoming laws, rules and programs – adding to the complexity of assigning costs specifically to this proposal. By the same token, benefits arising from maintenance or enhancement of additional species and other environmental benefits (e.g., public access to and enjoyment of shorelines) and from improved administrative coordination with the Growth Management Act, watershed planning, and other programs are recognized, but not evaluated.

It is also clear that protection of relatively intact and undeveloped habitats and ecosystems can be achieved more readily (but not without cost) than enhancement or restoration of degraded or developed shorelines. Further, it is apparent that additional development will take place in the future, with or without the proposed rule amendments. Even so, the potential effects of the proposal are not without value. The National Research Council study provides an apt summary:

“Whereas restoration<sup>19</sup> on the large landscape basis is...preferable to piecemeal restoration, small restoration efforts are not necessarily worthless or ineffective... any shift of a damaged ecosystem to a superior ecological condition is preferable to allowing the system to remain damaged or to suffer further degradation.”

In a final overview, then, this analysis gives rise to the following conclusions:

1. Various elements of the proposal (e.g., vegetation conservation) may impose additional costs on the development and/or use of properties in Shoreline Management Act jurisdiction. However, offsetting benefits are potentially available in many cases. Whether these are sufficient to fully outweigh the costs in any specific case – and whether they accrue to owners or others – these costs are not an unmitigated burden upon society at large.
2. A shift in emphasis toward practices more in keeping with natural processes (e.g., shoreline stabilization) will often yield results that are effective at

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<sup>19</sup> By implication, these remarks apply to preservation and protection of intact systems as well. See National Research Council [6], page 348 for the full text.

meeting the goals and needs of individuals or of society at large and are often less costly than more artificial practices.

3. Notwithstanding controversy about relationships between the Shoreline Management Act and the protection/enhancement of endangered fish populations, or the imprecision of current knowledge about underlying biology, the relationship between the health of aquatic ecosystems (and the species dependent upon them) and their associated shoreline environments is well established. It is also clear that even quite modest improvements in the status of threatened or endangered fish populations attributable to this proposal carry potentially significant societal benefits with them.

In view of the magnitude of the last of the above in relation to costs evaluated here a conclusion that the probable benefits of the proposal outweigh its probable costs appears warranted, pending the development of additional information.

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